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A DIGITAL INCLUSIVE SOCIETY STUDY – UNDERSTANDING THE SOCIAL IMPACTS OF INFORMATION COMMUNICATION TECHNOLOGY (ICT) USAGE IN CHINA

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Abstract

This paper discusses the role of self-efficacy to computer novices through a longitudinal study. The researchers conducted this study by collaborating with three non-government organizations (NGOs) for which funding was received from one government unit and a large local charitable organization. A new model was developed to examine the influence of Internet self-efficacy and outcome expectations on usage intention and perceived user competence. Behavioral modeling training courses were offered to matured adults aged 50 and above in two separate studies over a year. Questionnaires and cognitive knowledge assessments were distributed. In general, the findings in the two studies validated the impacts and antecedents of Internet self-efficacy and outcome expectations on usage intention. Limitations and implications of this study are provided following the sections on research model and hypotheses, design and discussion on findings.

Keywords: Digital inclusive society, Digital divide, Internet self-efficacy, Usage intention

1 BACKGROUND

1.1 Digital Inclusive Society and digital divide

Many countries nowadays are fully aware of what is the digital divide. It is broadly defined as the gap between the information communication technology (ICT) “have” and “have-nots.” The “have-nots” generally are the socially disadvantaged groups: lower income families, matured adults and senior citizens, people with disabilities and people with lower education attainment, and so on (Internet Professionals Association 2002). However, a “digital inclusive society” is a vision to be a place where: (1) everyone is able to explore the potential and benefits of new technologies; (2) can access and share information and services freely; and (3) can participate in the community more effectively. In other words, a “digital inclusive society” is a place where all people are able to access ICT first from schools, public facilities, homes, workplaces, and then extend the adoption of ICT to all public and business activities. Besides, it is a place where all people have the skills and knowledge to access what they need online and to use ICT (Sin Chung Kai Cyber Office 2002). In order to build a digital inclusive society, countries such as China and U.S. have been offering training programs and establishing computer facilities to general public in recent years. In this research, it is the investigators’ interest to narrow down the focus on matured adults (aged 50 and above), and to address a few challenges and opportunities that the digital divide brings forth to them.

2 RESEARCH MOTIVATION

The digital divide exists in both developed and less developed countries. The Hong Kong government and non-government organizations (NGOs) have been subsidizing activities and making efforts to promote IT awareness and accessibility to citizens including the socially disadvantaged groups by providing training courses and establishing computer facilities in various Hong Kong locations. But does that mean the digital divide will close eventually? Does the government have the appropriate yardsticks or standard of measurement for the success and failure of these social projects? Do matured adults intend to continue the usage of PCs and Internet services after the trainings? How can we know whether they can master the necessary IT skills in using the PCs and can access the Internet or not? Has learning and adopting IT made a difference in their lives? In view of these questions, a much more robust and rigorous research is called for. Within the Information Systems (IS) and Information Technology (IT) communities, understanding the intention of IT usage and evaluating user performance have been the major research studies for decades.

2.1 Research Objectives

Davenport and Markus (1999) urge researchers to conduct more relevant and timely research, especially those that apply appropriate academic theories to practical problems. They claimed that it is better for IS researchers to emulate colleagues in law and medical schools rather than those in other business disciplines. These are the two fields where practitioners actually read academic journals. It is the researchers’ ambition to follow their footsteps by conducting an applied research in order to get a grip on the digital divide phenomenon, and to fulfil the following research objectives:

- To test the validity and reliability of a proposed research model derived from Compeau and Higgins’ (1995b), within a specific context, i.e., use of Internet by matured adults. The proposed model also incorporates the four major information sources of self-efficacy theory (Bandura 1986) – enactive mastery, vicarious experience, verbal persuasion and emotional arousal.
- To examine factors of and relationships to Internet self-efficacy, outcome expectation, usage intention, and perceived user competence (cognitive knowledge).

- To measure the levels of changes, if any, on Internet self-efficacy, outcome expectation, and perceived user competence in a yearlong study.

3 RESEARCH MODEL AND HYPOTHESES

Understanding the factors that influence an individual's use of information technology has been a goal of IS research throughout the last two decades. The Theory of Reasoned Action (Fishbein and Ajzen 1975) is the first theoretical model that has gained widespread acceptance in the IT adoption research area. Other researchers have addressed the demand in looking for additional explanatory variables in computer usage (Thompson et al. 1991, Webster and Martocchio 1992). For example, Compeau and Higgins (1995b) examine the Social Cognitive Theory (SCT), the work of Albert Bandura (1986). Based on the literature review, interactions with and observations of socially disadvantaged groups and NGOs, the investigators believe that SCT serves as an important theory in explaining IT adoption among these groups in Hong Kong.

Referring to the works of Compeau et al. (1995a, 1995b), several key constructs are integrated into the proposed model: encouragement by others, outcome expectations, and anxiety. Additionally, three constructs are expanded upon: Internet self-efficacy, support, and usage intention in replacing computer self-efficacy, other's use and usage. The construct of user competence (Marcolin et al. 2000, Munro et al. 1987) is adopted as perceived user competence in the proposed model. It is believed that the adapted research model is applicable for this study on the IT usage and performance of matured adults in Hong Kong (Figure 1).

This study was carried out in collaboration with the Cyber Senior Network and Development Association, Ltd., Hong Kong Senior IT Advocates and the Internet Professionals Association. To the researchers' knowledge, it is the first empirical study of its own kind and the largest scale ever conducted in China. At the start of the research there were numerous meetings held with the representatives from NGOs, and several focus groups were held with matured adults and social workers. It is hoped that with certain levels of coaching and encouragement, as well as with the availability of hardware/software supports, the self-confidence of matured adults, their usage intention and cognitive knowledge may increase. In addition, the intention was to capture the changes in matured adults' Internet self-efficacy, their usage intention and competency in two separate studies. This longitudinal study ran from June 2002 to August 2003.

3.1 Behavioural Modelling Training Method

Learning by observation, or behaviour modelling, has been shown to be a powerful means of actual user behaviour (Latham and Saari 1979, Manz and Sims 1986, Schunk 1981). Behavioural modelling influences behaviour in part through its influence on self-efficacy (Bandura and Adams 1977), and also through its influence on outcome expectations (Bandura 1971). In this study, the investigators incorporate the behavioural modelling training method into the research model, and assume its positive influence on how matured adults learn new technology.

3.2 Encouragement by Others

The encouragement of others within the individual's reference group (i.e., people to whom someone looks to obtain guidance on behavioural expectations) can be expected to influence both self-efficacy and outcome expectations. Encouragement of use represents "verbal persuasion" one of the four major sources of efficacy information (Bandura 1986). In the current case, matured adults might respond to the opinions of others by forming judgments about their own abilities in using computers. Encouragement of use may also exert an influence on outcome expectations. For example, if people in matured adults' reference group (e.g. family, friends, staff at the social centers, and so on.), encourage the use of computing technology, their judgments about the probable and favorable outcomes of the

behavior will be affected. At the very least, they will expect that their peers will be pleased by the behaviour. Thus, the first two hypotheses are as follows:

H1: The higher the encouragement of Internet use by members of the reference group, the higher the Internet self-efficacy.

H2: The higher the encouragement of Internet use by members of the reference group, the higher the outcome expectations (performance and personal).

3.3 Support

Compeau and Higgins (1995b) specified that the support of the organization for computer users could be expected to influence individuals' judgments of self-efficacy. In this context, the organization will be the learning institution, the community centre and/or the computer laboratory. It is believed that the availability of assistance to matured adults should increase their abilities and probably, their perceptions of their abilities. Triandis (1980) defines "facilitating conditions" or "support" as external resource constraints. Taylor and Todd (1995) further segregated this construct into two dimensions: one relating to resource factors, such as time and money, and the other relating to technology compatibility issues that may constrain usage. In this research, support, such as organizational and technical supports, is the main focus. Support can also affect outcome expectations because these support systems reflect the expectations of these institutions toward the behaviour, and therefore may provide clues as to the likely consequences of using the computer. Thus, hypotheses 3 and 4 are as follows:

H3: The better the support provided for matured adults at an institution, the higher their Internet self-efficacy.

H4: The better the support provided for matured adults at an institution, the higher their outcome expectations (performance and personal).

3.4 Internet Self-efficacy

Social cognitive theory provides a prominent role to self-efficacy perceptions. Self-efficacy judgments are seen to influence outcome expectations since "the outcomes one expects derive largely from judgments as to how well one can execute the requisite behaviour" (Bandura 1978, p. 241). Current studies define Internet self-efficacy as the performance of specific tasks such as entering World Wide Web addresses, creating bookmarks and folders, using File Transfer Protocol (FTP) and telnet (Nahl 1996, 1997). Ren's (1999) measure of Internet self-efficacy is tailored to searching for government information sources. Eastin and LaRose (2000), however, look at the overall Internet usage and not just performing a specific Internet-related task like emailing. Thus, Internet self-efficacy may be differentiated from computer self-efficacy as the belief that a person can utilize effectively the Internet over and above basic personal computer skills. The hypothesis is:

H5: The higher the Internet self-efficacy, the higher the outcome expectations (performance and personal).

Self-efficacy judgments are held to have influence on the emotional responses of the individual. Individuals normally prefer and like behaviours that they feel they are good at and avoid those that they are not. Anxiety is measured and not affect in assuming that matured adults have formed general fondness and genuine interest toward computer learning. It is believed that matured adults will experience a lot of anxiety and then worry that they will cause chaos on the computers. By including the construct, anxiety, at this early stage of the study, a plausible research model for better interpretation and prediction can be obtained. This relationship is predicted by hypothesis 6 as follows:

H6: The higher the Internet self-efficacy, the lower the degree of anxiety.

3.5 Usage Intention

Self-efficacy perceptions are predicted to be a significant precursor to computer use. This hypothesis is supported by research regarding computer use (Burkhardt et al. 1990, Hill et al. 1987) and research in a variety of other domains (Bandura and Adams 1977, Betz and Hackett 1981, Frayne and Latham 1987). In this specific context, matured adults will be offered computer training for the first time, and then their intention of future Internet use is measured.

H7: The higher the Internet self-efficacy, the higher the intention of Internet usage.

3.6 Perceived User Competence

Marcolin et al. (2000) suggested that user competence by end users is an important measure besides IT adoption and IT usage. Munro et al. (1987) proposed a specific research model on user competence and its relationship with certain individual factors—self-efficacy, usage and demographics. No empirical research has been seriously done on this matter, thus in this study the correlation of self-efficacy to matured adults' perceived user competence is explored. Since in this study, matured adults are computer novices, only their perceptions on how much they know about using computers and the Internet can only be measured, rather than their actual knowledge. Thus, we add this construct into the model by proposing the following hypothesis:

H8: The higher the Internet self-efficacy, the higher the perceived user competence.

3.7 Outcome Expectations

Outcome expectation is also an important predecessor to usage behaviour. According to social cognitive theory, individuals are more likely to engage in behaviour they expect will result in favourable outcomes. The hypothesis is also supported by IS research (Davis et al. 1989, Hill et al. 1987, Pavri 1988, Thompson et al. 1991). Accordingly, the next hypothesis is:

H9: The higher the outcome expectations (performance and personal), the higher the intention of Internet usage.

3.8 Anxiety

Feelings of anxiety surrounding computers are expected to negatively influence computer use. Not surprisingly, people are expected to avoid behaviours that arouse nervousness. A numbers of studies have demonstrated a relationship between computer anxiety and the use of computer (Igbaria et al. 1989, Webster et al. 1990). This gives rise to the following hypothesis:

H10: The higher the Internet anxiety, the lower the intention of Internet usage.

4 RESEARCH DESIGN

The target population of this research is matured adults aged 50 and above, who reside in Hong Kong, China. Statistics shows that those aged 50 and above have less exposure to computers and Internet usage compared to other age groups (Sin Chung Kai 2002). The target population are novices with no or little previous computer experience, but who want to learn using the computer to access the Internet. Advertisements on free computer training lessons were placed at several local daily newspapers, and were announced over the local radio stations. Potential participants were first screened to ensure that they had little prior experience with computers. The screening took place during a telephone interview, and decisions were based on the judgment of the potential participants. While some had minimal computer use, they all considered themselves to be novices.

4.1 Pre-test of Questionnaire and Pilot Study

Since our target participants could not read English well (most of them did not receive formal education), the original script of the questionnaire was translated into Chinese. Afterwards, the Chinese copies were given to three post-graduate students in the IS field and one social worker for proof reading purpose. They were asked to translate the questionnaire back into English text. The researchers then compared the English version to the Chinese version so that the wordings and meanings were not lost in translations.

A pre-test of the questionnaire was conducted with eight people, including three scholars from the Faculty of Business at a local university, two social workers and three administrative staff of NGOs. Each respondent completed the questionnaire and provided feedback regarding the wording of the questions, the process and the measures. A pilot study involving 58 participants from the sampling frame ($n=100$) was also conducted. In this pilot study valuable feedback on the questionnaire instrument was given, and the sample size of this survey ($n=1,000$) was defined.

4.2 Basic Computer Literacy Training Sessions

In studies one and two, ten tutors, previously trained by the organizers to teach participants basic computer and Internet skills, were hired to conduct the training sessions. Additionally, five student volunteers were recruited from a local high school and a university. The four-hour training course included a one and a half hour lecture/demonstration and practice session. The lecture (45 minutes) provided basic information about the computer equipment, the operating system being used, and the techniques of browsing the Internet. Participants were shown how to operate the keyboard and mouse in order to browse websites and exchange emails on the Internet. The tutors followed a fixed outline but questions related to this course were answered as they arose. Next, participants were given 45 minutes to practice what they had learned. Training notes and pre-registered email logins, passwords, and email addresses were also given to participants. In study one, following the practice session, a questionnaire and a knowledge assessment (multiple choice and hands-on combined) were then administered. At the end of the session “certificates of completion” were presented to participants. However, in study two, no assessment was given to participants due to practical constraints, i.e. time limit and the length of questionnaire.

5 FINDINGS

5.1 Study One

A total of five hundred and fifty-five matured adults attended the computer training classes, thus the response rate was 55.5 percent ($n=1,000$). While this response rate could be acceptable for research of this nature, a non-response bias was a concern and Compeau and Higgins' (1995b) approach in weighing non-response bias was followed. Using the early (first week) and late (after four weeks) responses to the questionnaire, a multivariate analysis of variance (MANOVA) was undertaken to determine whether differences in response times (early versus late) were associated with different responses. The variation of demographic data (i.e., age, gender, and education level) of our respondents tested. A two-way mixed (between-within) ANOVA test from SPSS indicated no significant differences in any of the variables of interest (Wilks' $\lambda = 0.999$; $p = 0.874$). Data analyses were performed using Partial Least Square. Seven out of ten paths were found to be significant as shown in Figure 2.

5.2 Study Two

A total of three hundred and thirty-eight matured adults attended the second computer literacy training classes. The response rate was 60.9% (n=555). Respondents were identified and matched in both studies by a unique, pre-assigned email account and an advanced class voucher. In order to assess non-response bias, a comparison of demographics was made on study one demographic data for respondents who completed only the study one survey and those who completed both study one and two surveys. An independent-samples t-test in SPSS revealed no significant differences for age ($p = 0.689$), gender ($p = 0.517$), and education level ($p = 0.493$), at 0.05 level. It became clear that anxiety had no direct effect on usage intention, so this path in study two was removed. All seven paths provided support to the hypotheses as shown in Figure 3.

6 DISCUSSION

Overall, the findings in both studies gave strong supports to the research models. Encouragement by others exerted influence on Internet self-efficacy and outcome expectations. Support had no effect on Internet self-efficacy in the first study compared to the result in the second study probably due to two reasons: (1) the English version of Microsoft Window was used in study one, whereas the Chinese version of Microsoft Window was used in study two; and (2) participants were still unfamiliar with typing on a keyboard and manoeuvring the mouse in study one. On the other hand, the relationship of support and outcome expectations was significant. Participants were seen to be more likely to perform online tasks after they were exposed to computers and the Internet. The impact of Internet self-efficacy on outcome expectations in study one was weak compared to the strong impact in study two. As in study one, participants were computer novices and were not confident in their capabilities of engaging in various online tasks. However, over time and with adequate training and practice, matured adults' confidence was boosted and they expected they have the skill in performing online tasks. Internet self-efficacy was negatively related to anxiety as predicted earlier. The more confidence matured adults had, the less worried they were in using the computer and the Internet.

Internet self-efficacy exerted strong influence on usage intention in both studies. Outcome expectations had significant influence on usage intention, and its path coefficient intensified from study one to study two. When matured adults progress in their skills, they are more likely to engage in online activities. Although anxiety is related to usage intention in the direction hypothesized, its effect was rather weak. Simply lowering the arousal of anxiety of participants did not stimulate matured adults continuance of usage. However, Internet self-efficacy and outcome expectations and their antecedents played key roles in generating interest.

It is noted that over time it was possible to proceed to directly measure the link between Internet self-efficacy and actual use, and its reciprocal relationship. Previous studies acknowledged that self-efficacy has a direct effect toward computer usage (Compeau et al. 1995b and 1999, Igarria and Iivari 1995). Bandura (1986) states the reciprocal relationship of self-efficacy and use – self-efficacy is viewed as an antecedent to use, but successful prior experience with computer is also viewed as influence on self-efficacy. Also, construct items like self-efficacy, outcome expectations, and usage intention, as well as perceived user competence, would need fine-tuning when conducting a longitudinal study. Otherwise, the explanatory power of the structural model could be diminished over time. As matured adults progress, they thrive for new knowledge, as they perceive they have successfully mastered basic computer knowledge. They can learn other online tasks, like downloading pictures, utilizing search engines, and so on.

7 LIMITATIONS

There are several limitations to this study. First of all, the differences in sample sizes could be a potential problem, although non-response bias was treated. Also, a convenient sampling approach was used instead of random sampling. Ads were placed through mass media, but participants were not randomly selected from the entire matured adults population segment. Third, the assumption of the positive influence of the behavioural modelling training method in this study was made based on similar studies reported in literature. In addition, “prior experience” was embedded into hands-on experience through training (i.e. enactive mastery); however, between trainings and practices, participants would gain experience and a construct in the model was not used to measure its effect. Furthermore, there was a long lapse of time between the three studies. Other exogenous variables (e.g. cultural factor) may have come into play and affected the results, which could not be foreseen and measured.

8 CONTRIBUTIONS AND IMPLICATIONS

8.1 Theoretical Contributions

Compeau et al. (1995a, 1995b, 1999) proposed that longitudinal studies and experiment research methods are necessary in confirming the effects of the antecedents of self-efficacy and its influence on outcome expectations and usage, plus the relationship of self-efficacy and user competence. By conducting these two empirical studies, it is believed that the authors’ calls have been partially answered, and that the theoretical understanding of the connections of these variables could actually address the issue of building a digital inclusive society. To a certain extent, a new and critical viewpoint of the causal relationship of Internet self-efficacy and usage intention has been offered. The foundation for future IS research interest has been set, so that scholars may adopt the models and measurement scales in other contexts, e.g. improving the computer literacy level and skill of low income families in rural areas in mainland China by special designed training programs. This study has focused on studying the impact of self-efficacy to matured adults aged 50 and above, a distinct group of computer users compared to the general workforce. Currently in the IS field, no study has been done in developing a new model to explain causal relationships among the above-mentioned constructs. This study points to a new group for the continuance of ICT usage – matured adults. This new user group of ICT could potentially expand to a large (and loyal) virtual community.

8.2 Practical Contributions

This study has made an attempt in understanding the social impacts of ICT to one type of social disadvantaged groups. It is hoped to narrow the digital divide by continuously offering computer training to matured adults or so called “baby-boomers” in U.S. This is new knowledge for a unique community of stakeholders in the world societies – government (policy making), NGOs (training classes), and business corporations (provide products/services). Through understanding of this population segment, new markets have been discovered and services and products can be tailor made to their special needs, such as online banking; user interface designs, new adaptive software and hardware, etc. Last but not least, the findings indicate that computer training improves the psychological state of mind of these matured adults. Their self-confidence is boosted as they gain a developed sense of achievement. They feel better about themselves for they can communicate with other groups in sharing their knowledge about a new subject area, the computer and the Internet.

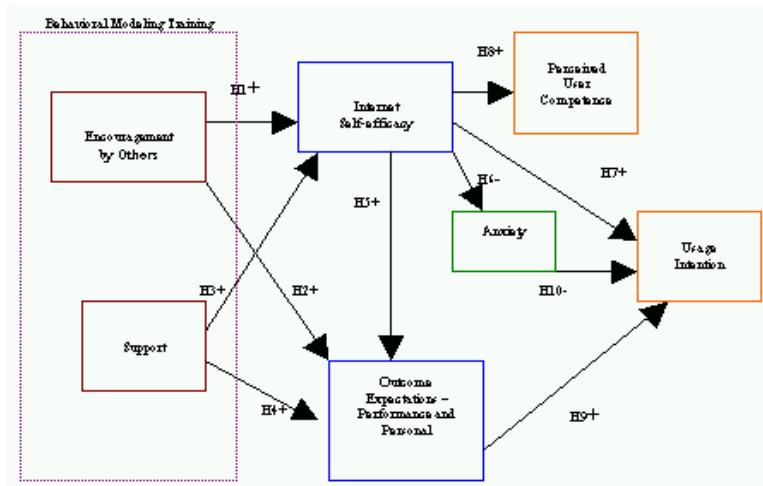


Figure 1. Proposed Research Model

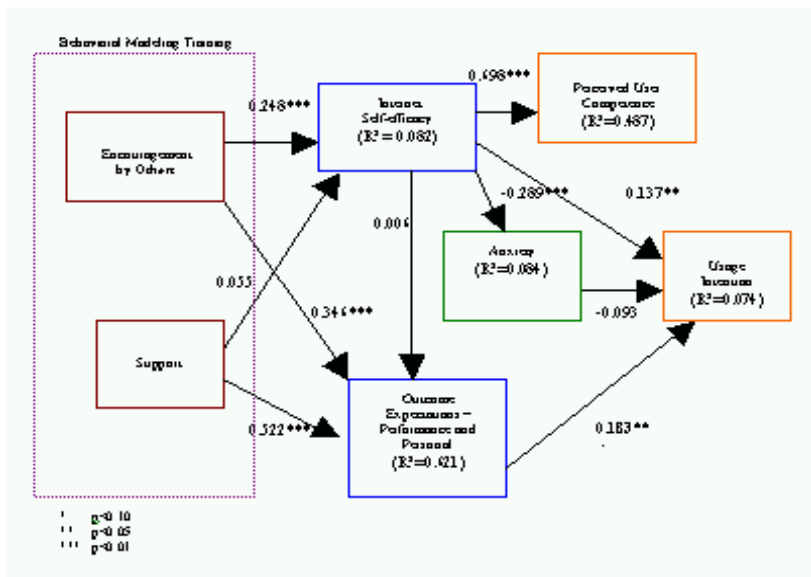


Figure 2. Study One Model and Path Coefficients

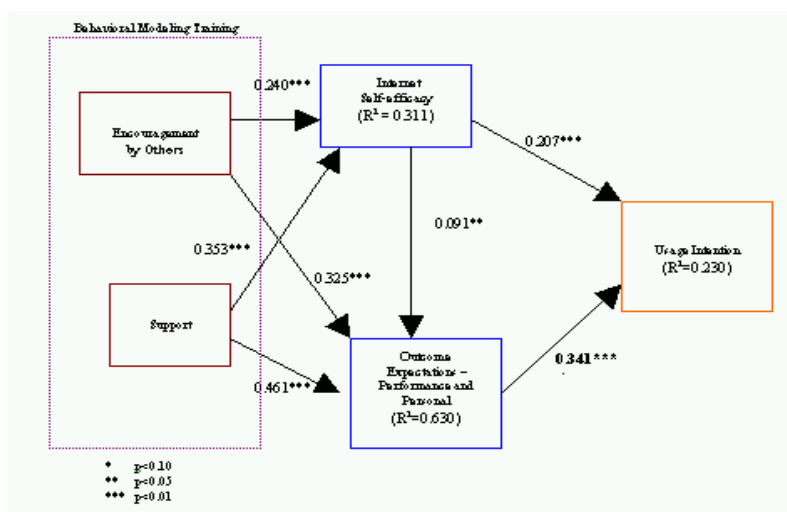


Figure 3. Study Two Model and Path Coefficients

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